

Attorney Docket No. 3220-73090
Application No. 10/616,564 (Filed July 10, 2003)
Reply to Office Action dated January 3, 2007

LISTING OF CLAIMS

This listing of claims below will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1.(Currently amended) A method of measuring an amount of an organic substance contained within a food product, said organic substance having an infrared absorption spectrum which includes a set (n) of infrared absorption bands, the method comprising:

(a) passing infrared electromagnetic radiation ~~through~~ through said food product containing said organic substance;

(b) detecting the intensity of infrared electromagnetic radiation passing through said food product containing said organic substance in ranges of wavelengths corresponding to each of a subset of said (n) infrared absorption bands to provide electrical signals corresponding thereto; **and**

(c) processing said electrical signals with a quantification algorithm so as to provide a measurement of said amount of said organic substance contained within said food product, ~~wherein said quantification algorithm includes dividing a first wavelength band integrated absorbance value by a reference wavelength band integrated absorbance value in which said organic substance does not substantially absorb said infrared electromagnetic radiation; and~~

(d) outputting said measurement.

2.(Canceled)

3.(Previously presented) The method of claim 1, wherein:

(b) includes detecting the intensity of (i) about a 905 - 930 cm⁻¹ wavelength band of infrared electromagnetic radiation and (ii) about a 880 - 890 cm⁻¹ reference wavelength band of infrared electromagnetic radiation in which said organic substance does not substantially absorb said infrared electromagnetic radiation, and

said quantification algorithm of (c) includes dividing said 905 - 930 cm⁻¹ wavelength band integrated absorbance value by said 880 - 890 cm⁻¹ reference wavelength band integrated absorbance value.

4.(Previously presented) The method of claim 1, wherein:

(b) includes detecting the intensity of (i) about a 2905 - 2945 cm⁻¹ wavelength band of infrared electromagnetic radiation and/or (ii) about a 2840 - 2870 cm⁻¹ wavelength band of infrared electromagnetic radiation.

5.(Previously presented) The method of claim 1, wherein:

said subset of said (n) wavelength bands of (a) (b) is within a range defined by 800 - 1000 cm⁻¹.

6.(Previously presented) The method of claim 1, wherein:

said subset of said (n) wavelength bands of (b) is within a range defined by 2800 - 3000 cm⁻¹.

7.(Currently amended) A method of measuring an amount of a vegetable seed oil in a food product, wherein said vegetable seed oil has an infrared absorption spectrum which includes a set (n) of infrared absorption bands, the method comprising:

(a) passing infrared electromagnetic radiation ~~through~~ through said food product containing said vegetable seed oil;

(b) detecting the intensity of infrared electromagnetic radiation passing through said food product containing said vegetable seed oil in ranges of wavelengths corresponding to each of a subset of said (n) infrared absorption bands to provide electrical signals corresponding thereto; and

(c) processing said electrical signals with a quantification algorithm so as to provide a measurement of said amount of said vegetable seed oil contained within said food product, wherein said vegetable seed oil does not substantially absorb said infrared electromagnetic radiation in a reference wavelength band, and said quantification algorithm includes dividing a first wavelength band integrated absorbance value by a reference wavelength band integrated absorbance value; and

(d) outputting said measurement.

8.(Canceled)

9.(Previously presented) The method of claim 7, wherein:

(b) includes detecting the intensity of (i) about a $905 - 930\text{ cm}^{-1}$ wavelength band of infrared electromagnetic radiation and (ii) about a $880 - 890\text{ cm}^{-1}$ reference wavelength band of infrared electromagnetic radiation.

10.(Previously presented) The method of claim 7, wherein:
said subset of said (n) wavelength bands of (b) is within a range defined by $800 - 1000\text{ cm}^{-1}$.

11.(Original) The method of claim 7, wherein:
said food product includes olive oil.

12.(Currently amended) A method of measuring an amount of milk fat in a food product, wherein said milk fat has an infrared absorption spectrum which includes a set (n) of infrared absorption bands, the method comprising:

(a) passing infrared electromagnetic radiation ~~through~~ said food product containing said milk fat;

(b) detecting the intensity of infrared electromagnetic radiation passing through said food product containing said milk fat in ranges of wavelengths corresponding to each of a subset of said (n) infrared absorption bands to provide electrical signals corresponding thereto; and

(c) processing said electrical signals with a quantification algorithm so as to provide a measurement of said amount of said milk fat contained within said food product, wherein said quantification algorithm includes dividing a first wavelength band integrated absorbance value by a reference wavelength band integrated absorbance value in which said milk fat does not substantially absorb said infrared electromagnetic radiation; and

(d) outputting said measurement.

13.(Previously presented) The method of claim 12, wherein:
(b) includes detecting the intensity of about a $2905 - 2945\text{ cm}^{-1}$ wavelength band of infrared electromagnetic radiation.

14.(Previously presented) The method of claim 12, wherein:
(b) includes detecting the intensity of about a $2840 - 2870\text{ cm}^{-1}$ wavelength band of infrared electromagnetic radiation.

15.(Previously presented) The method of claim 12, wherein:

said subset of said (n) wavelength bands of (b) is within a range defined by 2800 - 3000 cm⁻¹.

16.(Original) The method of claim 12, wherein:
said food product includes milk.

17.(Currently amended) A method of measuring a concentration of an organic substance contained within a food product, said organic substance having an infrared absorption spectrum which includes a set (n) of infrared absorption bands and one or more reference wavelengths bands, wherein said organic substance does not substantially absorb said infrared electromagnetic radiation in said one or more reference wavelength bands, the method comprising:

(a) detecting the intensity of infrared electromagnetic radiation influenced by said organic substance in ranges of wavelengths corresponding to each of a subset of said (n) infrared absorption bands and in ranges of wavelengths corresponding to each of a subset of said one or more reference wavelength bands to provide electrical signals corresponding thereto; and

(b) processing said electrical signals with a mathematical model so as to provide a measurement of the concentration of said organic substance contained within said food product; and

(c) outputting said measurement.

18.(Previously presented) The method of claim 17, wherein:

(a) includes detecting the intensity of said infrared electromagnetic radiation influenced by a vegetable seed oil contained within said food product.

19.(Previously presented) The method of claim 17, wherein:

(a) includes detecting the intensity of said infrared electromagnetic radiation influenced by milk fat contained within said food product.

20.(Previously presented) The method of claim 17, wherein:

said mathematical model of (b) includes dividing an integrated absorbance value of one of said subset of said absorption bands by an integrated absorbance value of one of said subset of said reference wavelength bands.

21.(Previously presented) The method of claim 17, wherein:

said mathematical model of (b) includes the mathematical equation

$$C_f = P_0 + P_1 IA_{\lambda,1}$$

where (i) C_f is a mean-centered known concentration of milk fat in a food product, (ii) P_1 are calibration constants, and (iii) $IA_{\lambda,1}$ is a mean-centered integrated absorbance occurring in a selected wavelength band.

22.(Currently amended) A method of measuring an amount of an organic substance contained within a food product, said organic substance having an infrared absorption spectrum which includes a set (n) of infrared absorption bands, the method comprising:

(a) passing infrared electromagnetic radiation ~~through~~ through said food product containing said organic substance;

(b) passing infrared electromagnetic radiation passing through said food product containing said organic substance through a filter so that only electromagnetic radiation in ranges of wavelengths corresponding to a subset of said (n) infrared absorption bands is allowed to pass to a detector;

(c) detecting the intensity of infrared electromagnetic radiation passing through said filter to provide electrical signals corresponding thereto; and

(d) processing said electrical signals with a quantification algorithm so as to provide a measurement of said amount of said organic substance contained within said food product; and

(e) outputting said measurement.

23.(Currently amended) A method of measuring an amount of an organic substance contained within a food product, said organic substance having an infrared absorption spectrum which includes a set (n) of wavelength regions, wherein each of said wavelength regions substantially correspond to an absorption band of said absorption spectrum, comprising:

(a) illuminating said food product with infrared electromagnetic radiation;

(b) detecting the intensity of said infrared electromagnetic radiation that is absorbed by said organic substance contained within said food product, wherein (i) said intensity detection is restricted to a number of selected wavelength bands of infrared electromagnetic radiation, (ii) each of said selected wavelength bands substantially

corresponds to one of said wavelength regions, and (iii) said number of said selected wavelength bands is a subset of (n);

(c) generating an electrical signal in response to detecting the intensity of said subset of said selected wavelength bands;

(d) receiving said electrical signal with a signal processor configured to process said electrical signal with a quantification algorithm; and

(e) processing said electrical signal with said quantification algorithm so as to provide a measurement of said amount of said organic substance contained within said food product; product; and

(f) outputting said measurement.

wherein (b) includes detecting the intensity of one or more reference wavelengths bands of said infrared electromagnetic radiation which are not substantially absorbed by said organic substance contained within said food product, and

wherein (c) includes generating said electrical signal in response to detecting the intensity of said one or more reference wavelength bands.

24.(Previously presented) The method of claim 25, wherein said quantification algorithm includes dividing an integrated absorbance value of said one of said absorption bands by an integrated absorbance value of said one of said reference wavelength bands.

25.(Currently amended) A method of measuring an amount of an organic substance contained within a food product, said organic substance having an infrared absorption spectrum which includes a set (n) of infrared absorption bands and one or more reference wavelengths bands, wherein said organic substance does not substantially absorb said infrared electromagnetic radiation in said one or more reference wavelength bands, the method comprising:

(a) illuminating said food product with infrared electromagnetic radiation from an IR source;

(b) detecting the intensity of said infrared electromagnetic radiation influenced by said organic substance in a range of wavelengths corresponding to one of said absorption bands and a range of wavelengths corresponding to one of said reference wavelength bands to provide electrical signals corresponding thereto; and

(c) processing said electrical signals with a mathematical model to provide a measurement of said amount of said organic substance contained within said food product; and

(d) outputting said measurement.

26.(Currently amended) An apparatus for measuring an amount of an organic substance contained within a food product, said organic substance having an infrared absorption spectrum which includes a set (n) of infrared absorption bands and one or more reference wavelengths bands, wherein said organic substance does not substantially absorb said infrared electromagnetic radiation in said one or more reference wavelength bands, the apparatus comprising

(a) a detector operable to detect the intensity of infrared electromagnetic radiation passing through said food product containing said organic substance in a range of wavelengths corresponding to one of said infrared absorption bands and a range of wavelengths corresponding to one of said reference wavelength bands to provide electrical signals corresponding thereto; and

(b) a processor operable to process said electrical signals with a quantification algorithm so as to provide a measurement of said amount of said organic substance contained within said food product.

27.(Previously presented) An apparatus for measuring an amount of an organic substance contained within a food product, said organic substance having an infrared absorption spectrum which includes a set (n) of infrared absorption bands and one or more reference wavelengths bands, wherein said organic substance does not substantially absorb said infrared electromagnetic radiation in said one or more reference wavelength bands, the apparatus comprising

(a) a detector operable to detect the intensity of infrared electromagnetic radiation influenced by said organic substance in a range of wavelengths corresponding to one of said infrared absorption bands and a range of wavelengths corresponding to one of said reference wavelength bands to provide electrical signals corresponding thereto; and

(b) a processor operable to process said electrical signals with a quantification algorithm so as to provide a measurement of said amount of said organic substance contained within said food product.